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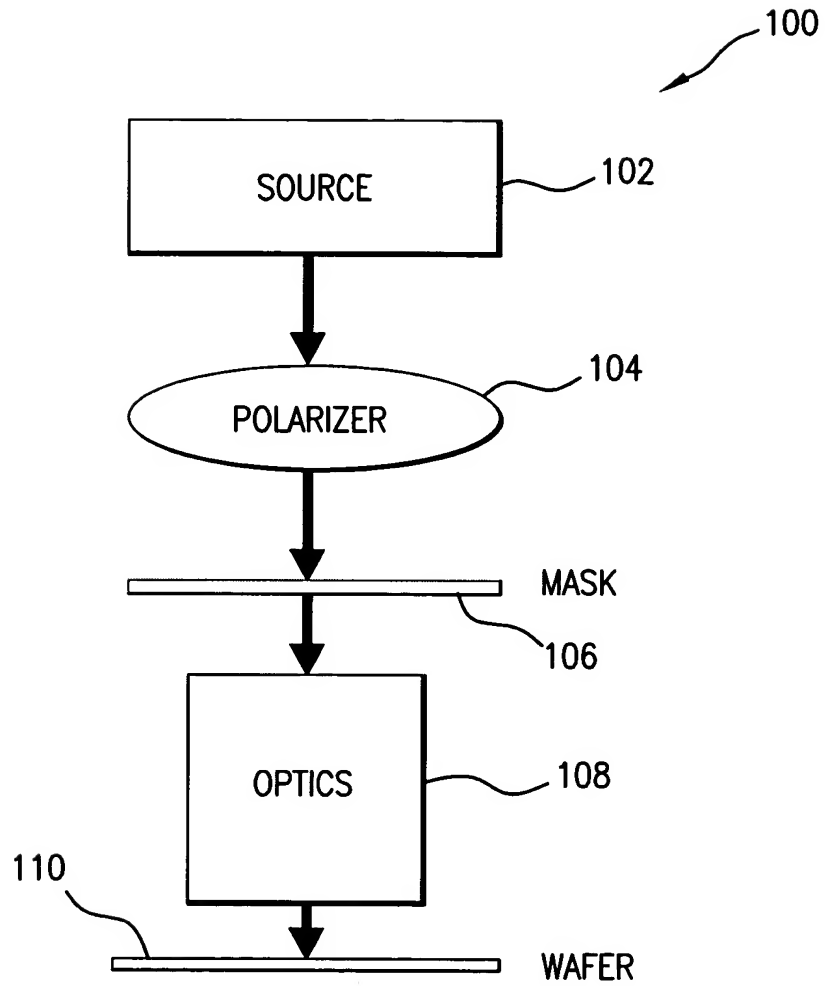
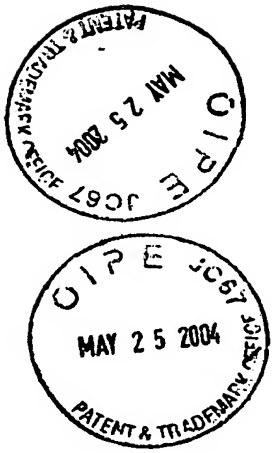


FIG. 1

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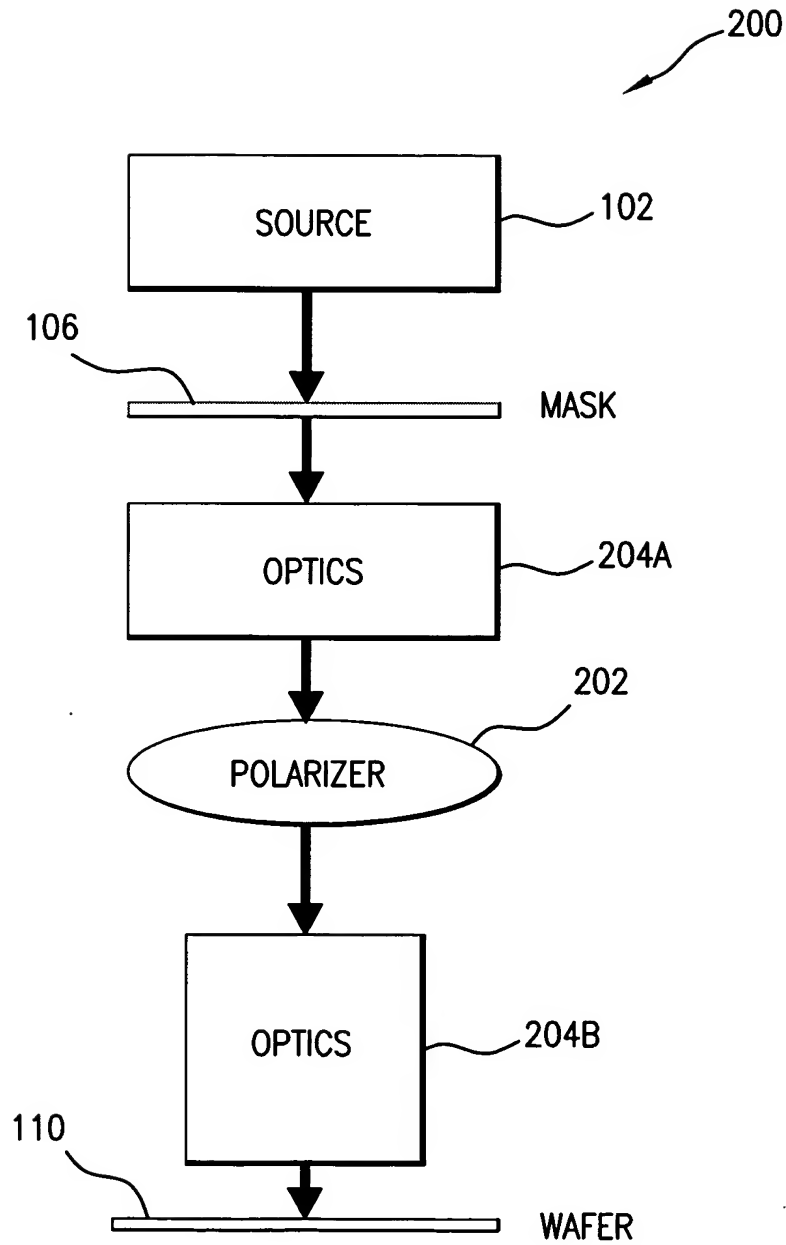


FIG.2

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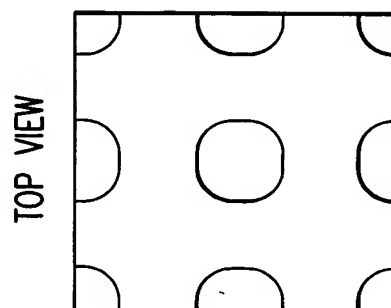
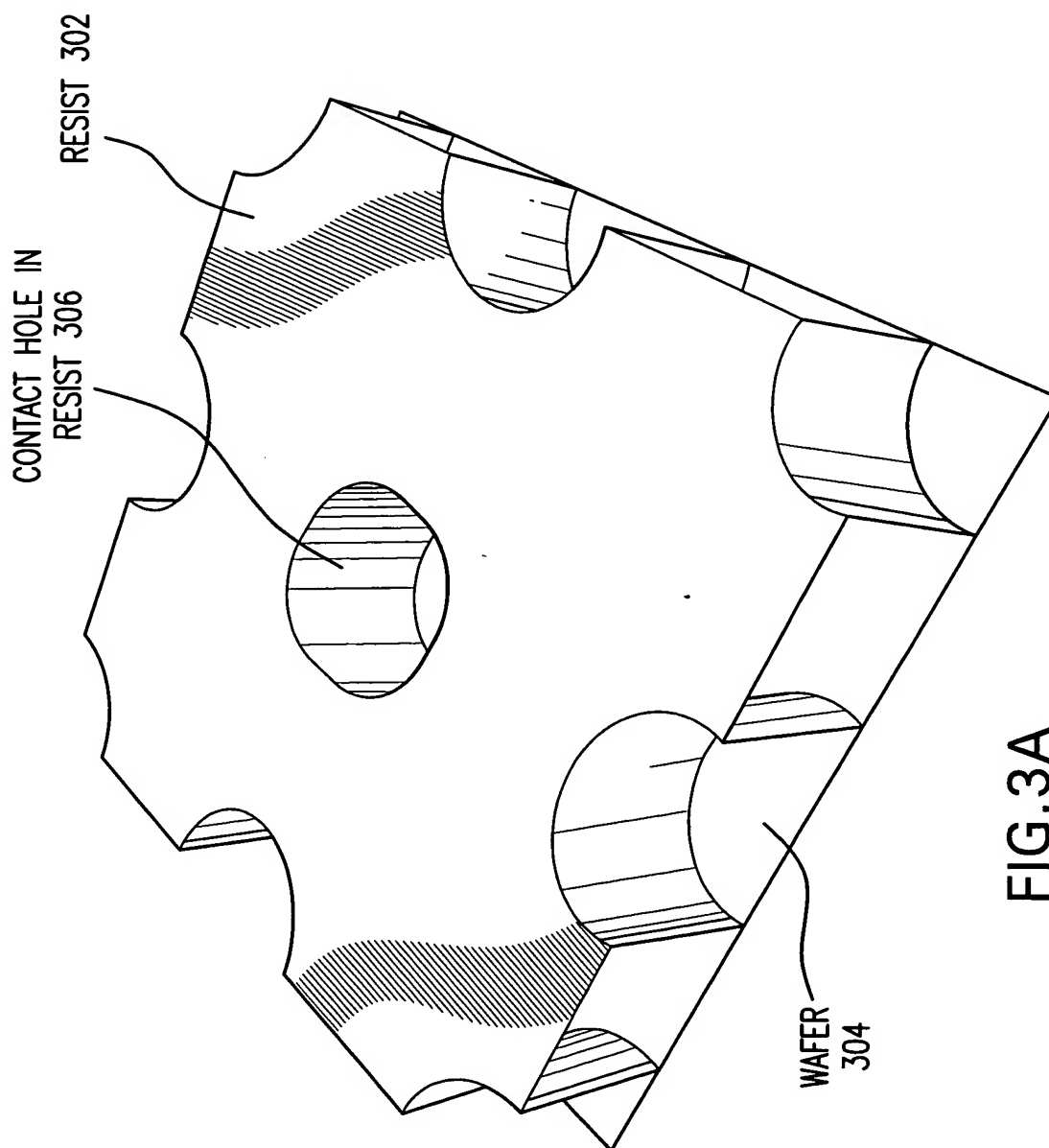


FIG. 3B

FIG. 3A

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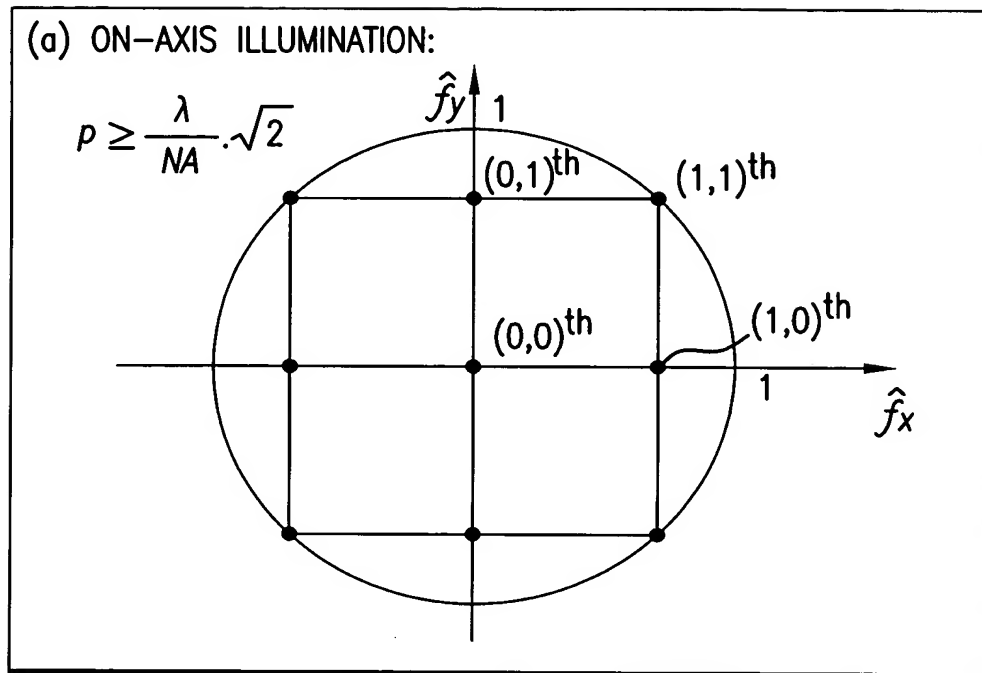


FIG.4A

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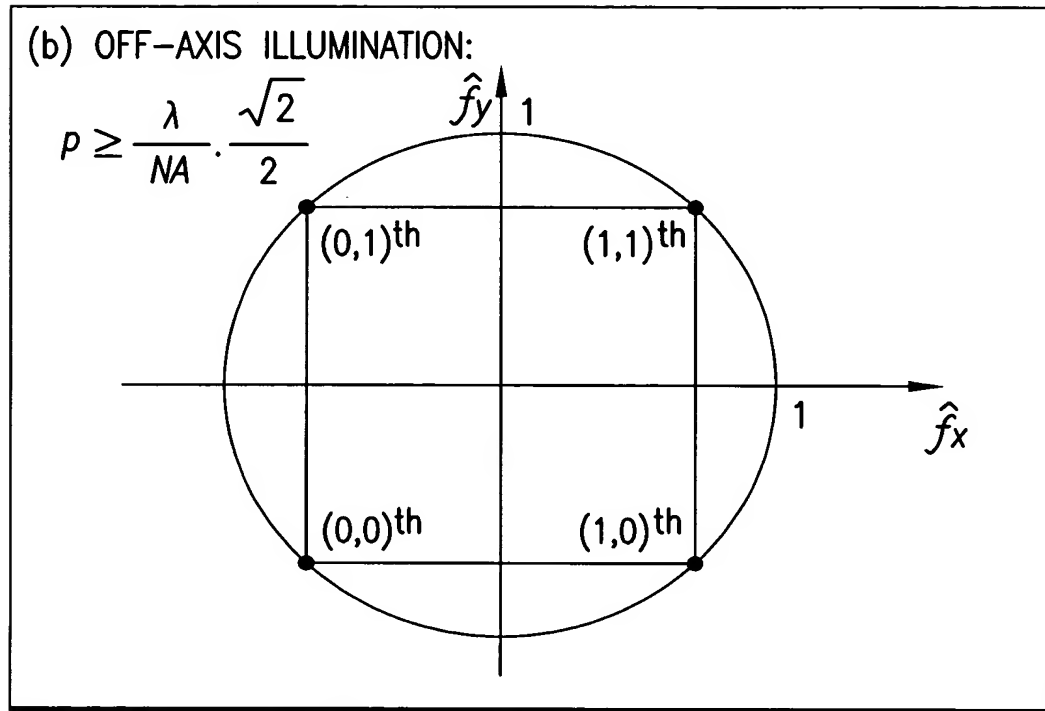


FIG.4B

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AERIAL IMAGE AT BEST FOCUS  
134 nm PITCH, 6% Att PSM, 67 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, UNPOLARIZED LIGHT,  
 $C_0=0.50$ ,  $C_{45\text{deg}}=0.65$   
 $\text{NILS}_0=1.55$ ,  $\text{NILS}_{45\text{deg}}=1.49$

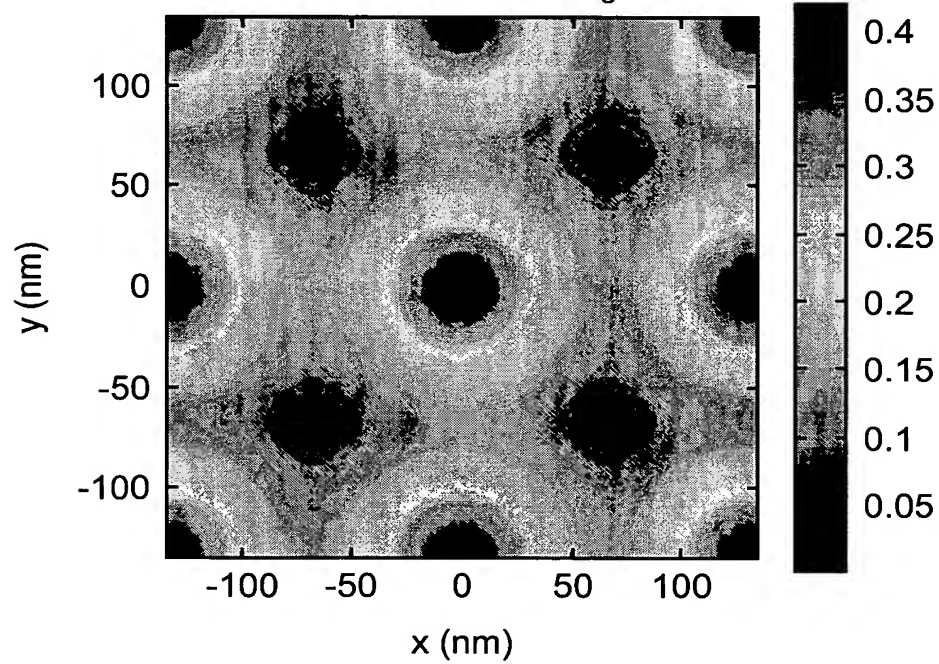


FIG.5

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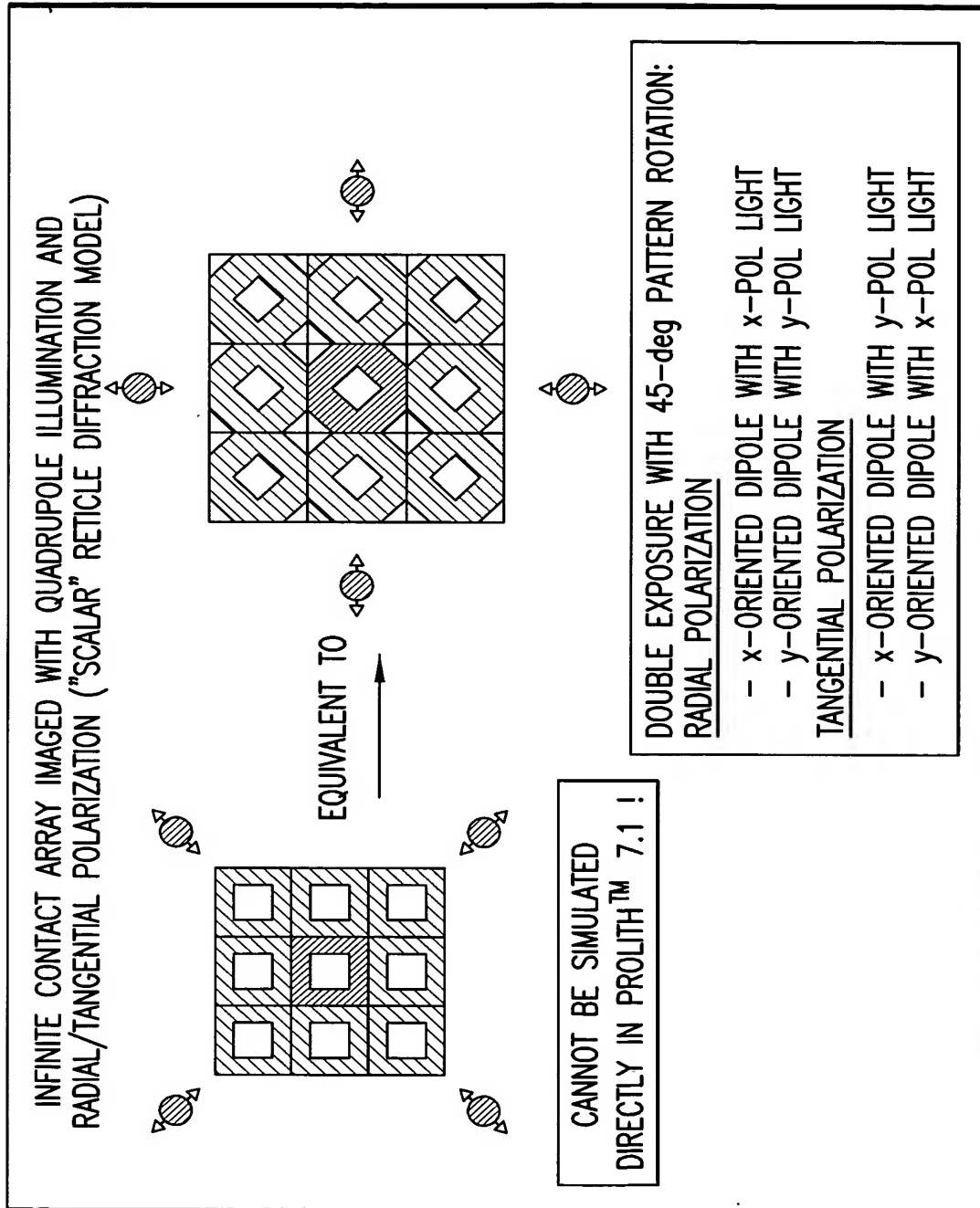


FIG.6



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AERIAL IMAGE AT BEST FOCUS  
134 nm PITCH, 6% Att PSM, 67 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_1=0.80$ ,  $C_2=0.55$   
 $NILS_1=2.30$ ,  $NILS_2=1.96$

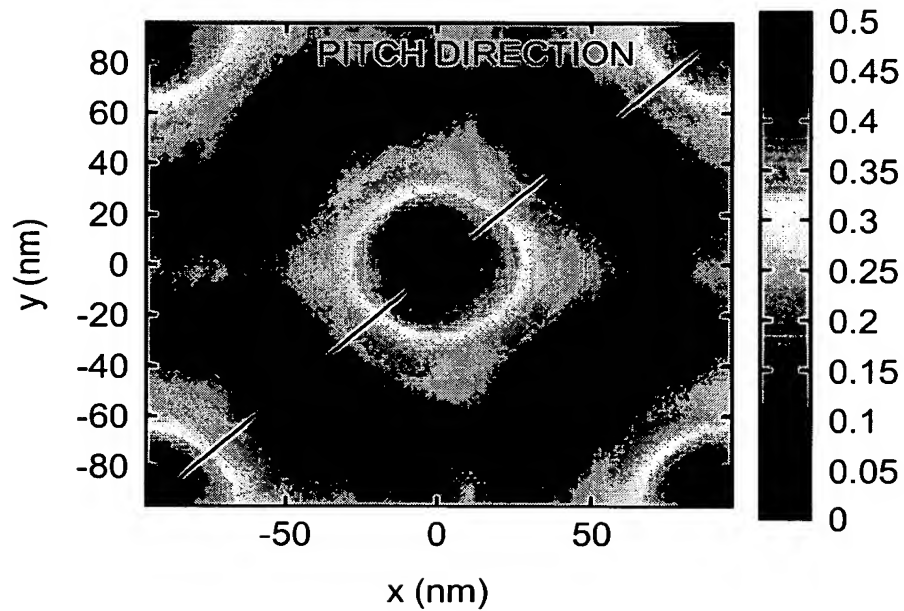


FIG.7A

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AERIAL IMAGE AT BEST FOCUS  
134 nm PITCH, 6% Att PSM, 67 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, TANGENTIAL POLARIZATION,  
 $C_1=0.19$ ,  $C_2=0.98$   
 $NILS_1=0.62$ ,  $NILS_2=0.94$

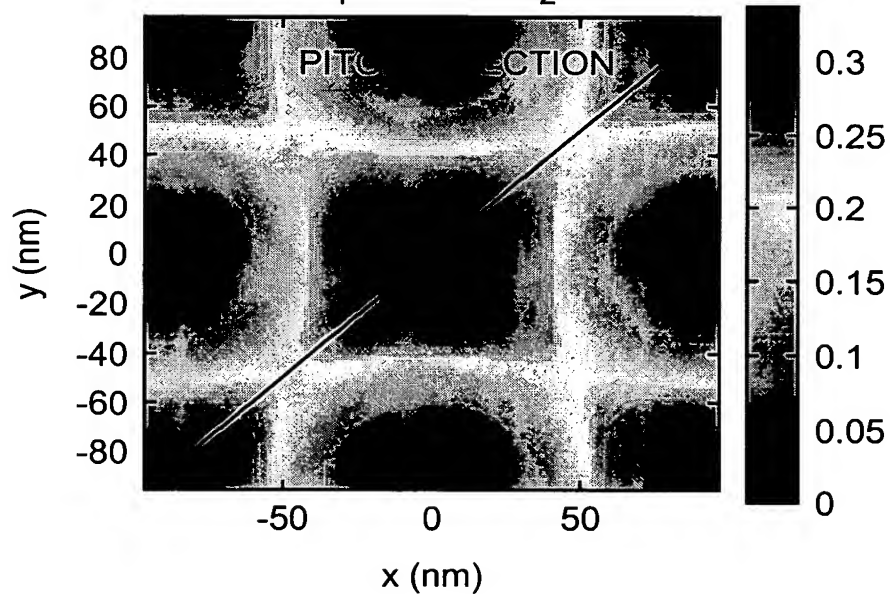


FIG.7B

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AERIAL IMAGE AT BEST FOCUS  
125 nm PITCH, 6% Att PSM, 75 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, UNPOLARIZED LIGHT,  
 $C_1=0.35$ ,  $C_2=0.61$   
 $NILS_1=1.10$ ,  $NILS_2=1.15$

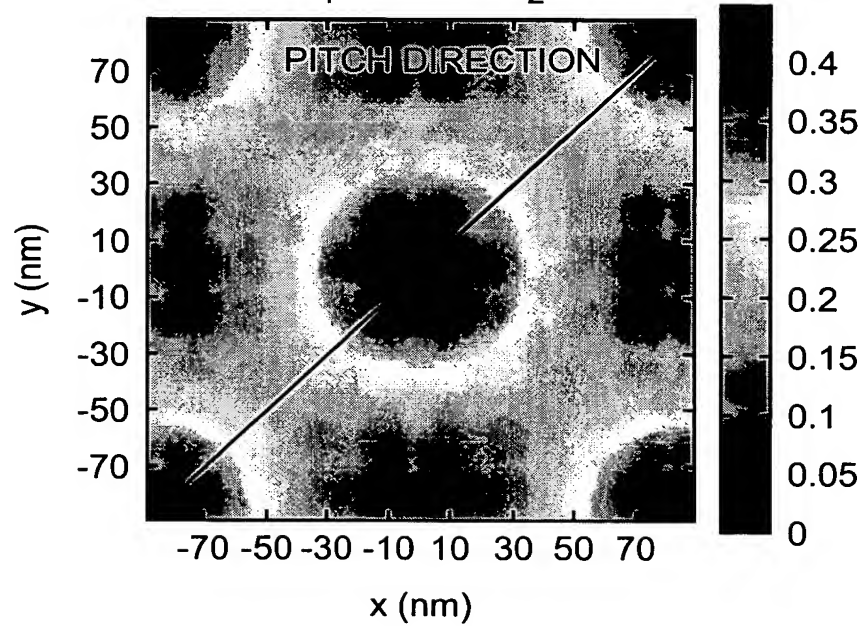


FIG.8A

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AERIAL IMAGE AT BEST FOCUS  
125 nm PITCH, 6% Att PSM, 75 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, TANGENTIAL POLARIZATION,  
 $C_1=0.17$ ,  $C_2=0.76$   
 $NILS_1=0.53$ ,  $NILS_2=0.81$

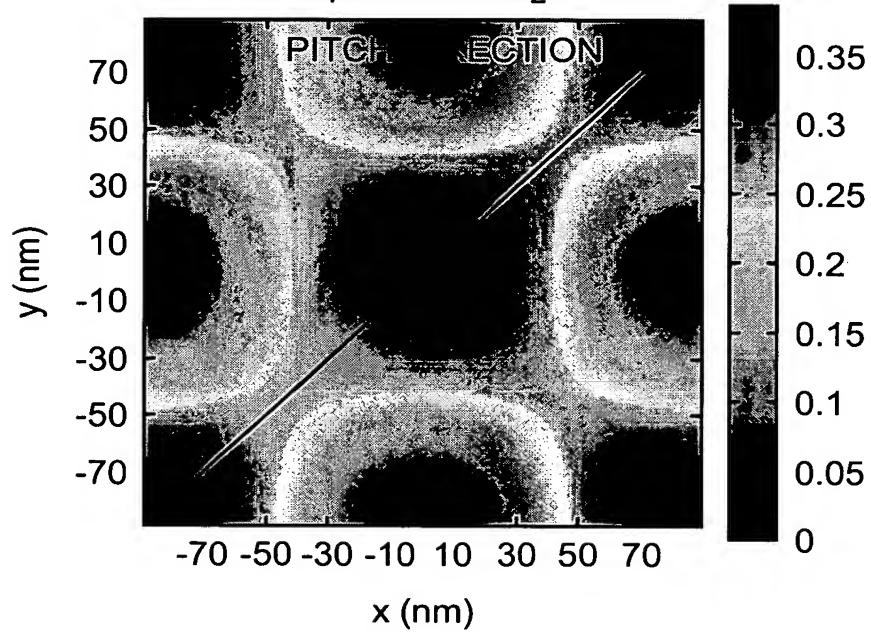


FIG.8B

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AERIAL IMAGE AT BEST FOCUS  
125 nm PITCH, 6% Att PSM, 75 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_1=0.53$ ,  $C_2=0.51$   
 $NILS_1=1.60$ ,  $NILS_2=1.47$

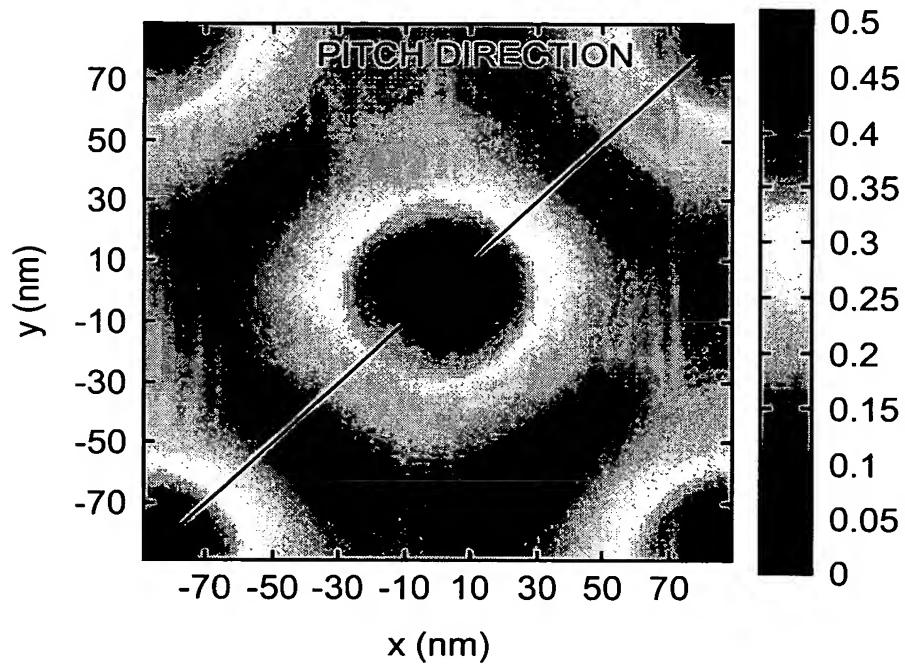


FIG.8C

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RESIST IMAGE AT BEST FOCUS  
100 nm PITCH, CHROMELESS PSM CONTACT HOLES  
QUADRUPOLE ILLUMINATION, UNPOLARIZED LIGHT

$C_0=0.67$ ,  $C_{45deg}=0.80$

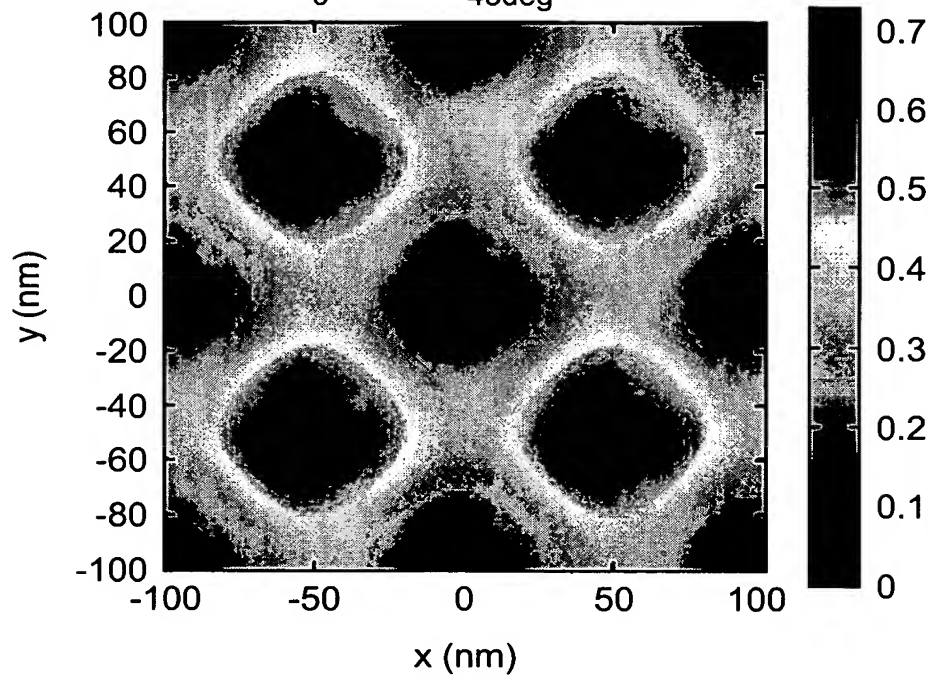


FIG.9A

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RESIST IMAGE AT BEST FOCUS  
100 nm PITCH, CHROMELESS PSM CONTACT HOLES  
QUADRUPOLE ILLUMINATION, TANGENTIAL POLARIZATION,  
 $C_0=0.44$ ;  $C_{45deg}=0.61$

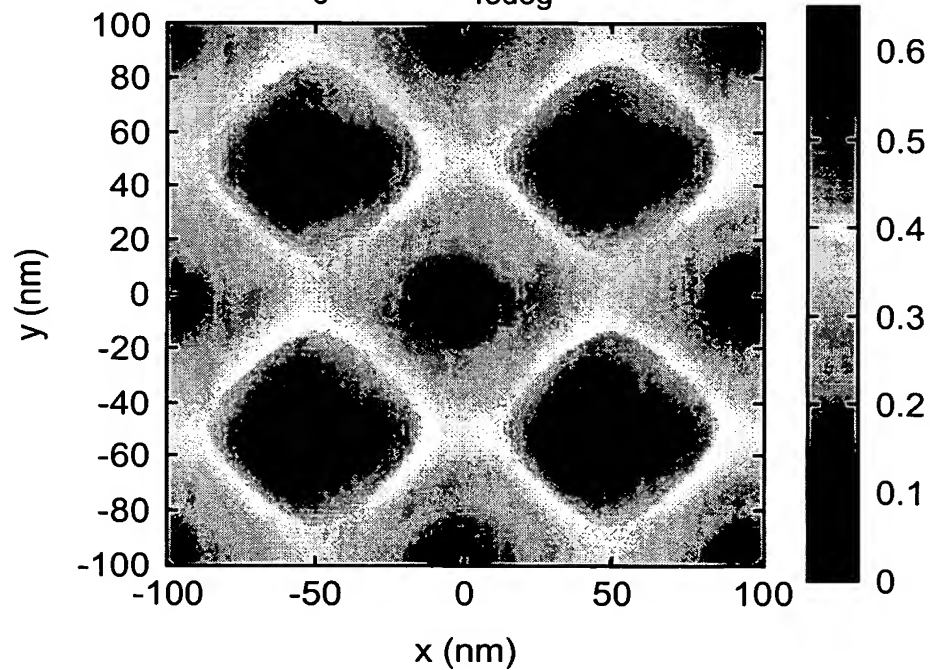


FIG.9B

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RESIST IMAGE AT BEST FOCUS  
100 nm PITCH, CHROMELESS PSM CONTACT HOLES  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_0=1.00$ ,  $C_{45\text{deg}}=1.00$   
 $\text{NILS}_0=2.96$ ,  $\text{NILS}_{45\text{deg}}=3.77$

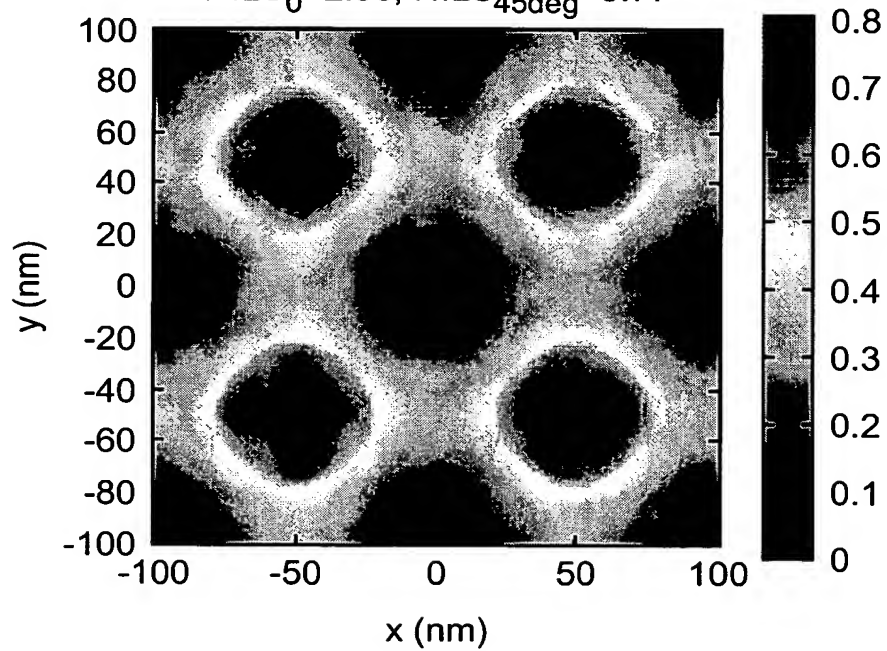


FIG.9C



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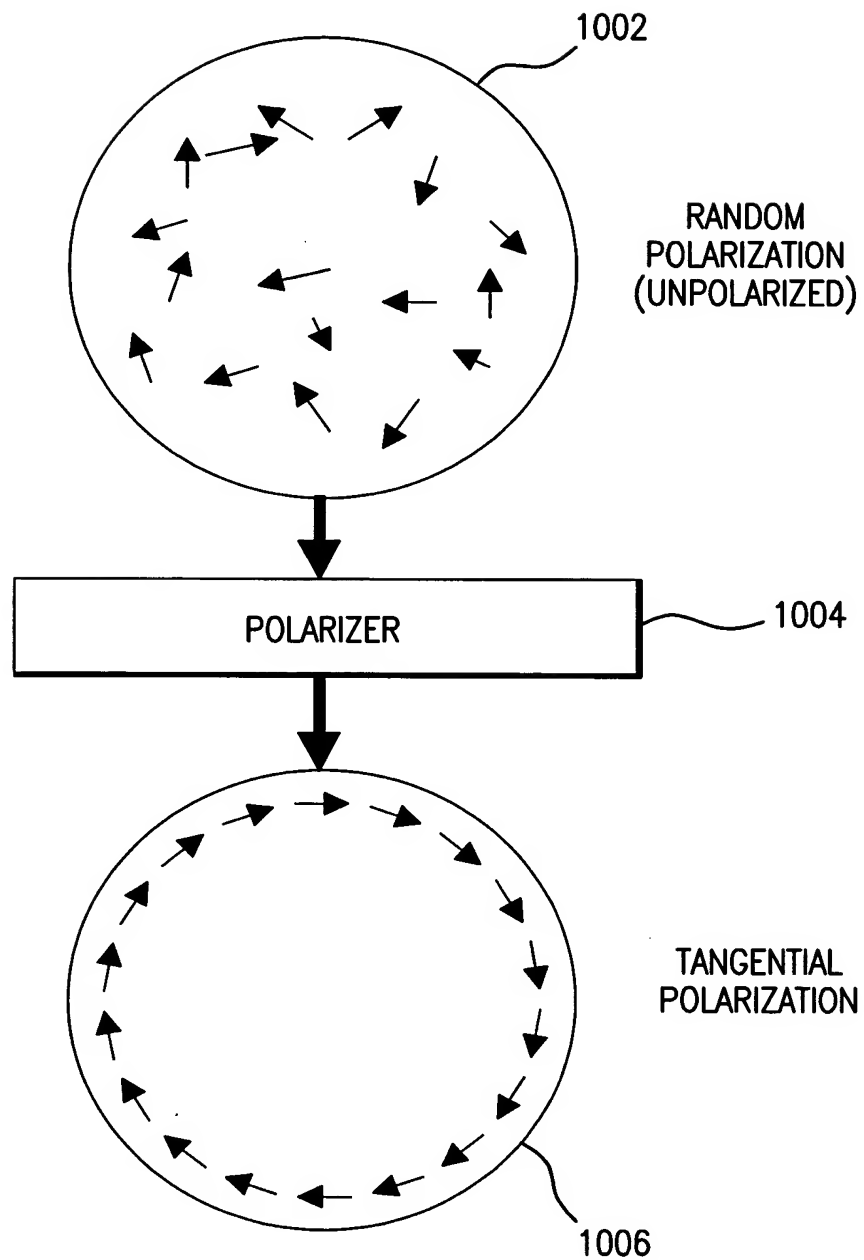


FIG.10A

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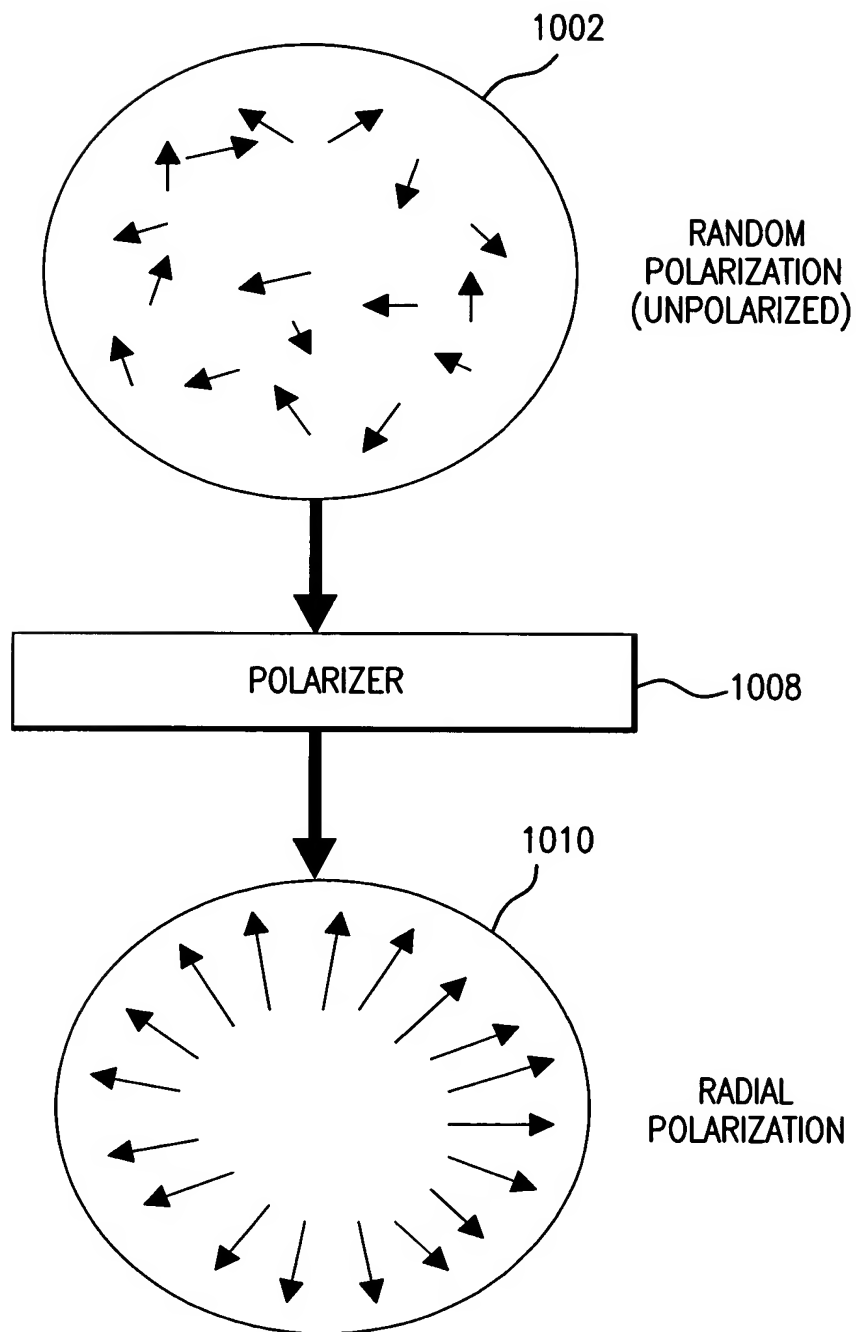


FIG. 10B

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RESIST IMAGE CD vs. PITCH  
VARIABLE PITCH CHROMELESS PHASE MASKS  
CARTESIAN 0.9/0.1 QUADRUPOLE ILLUMINATION, 0.93 NA, RADIAL POLARIZATION

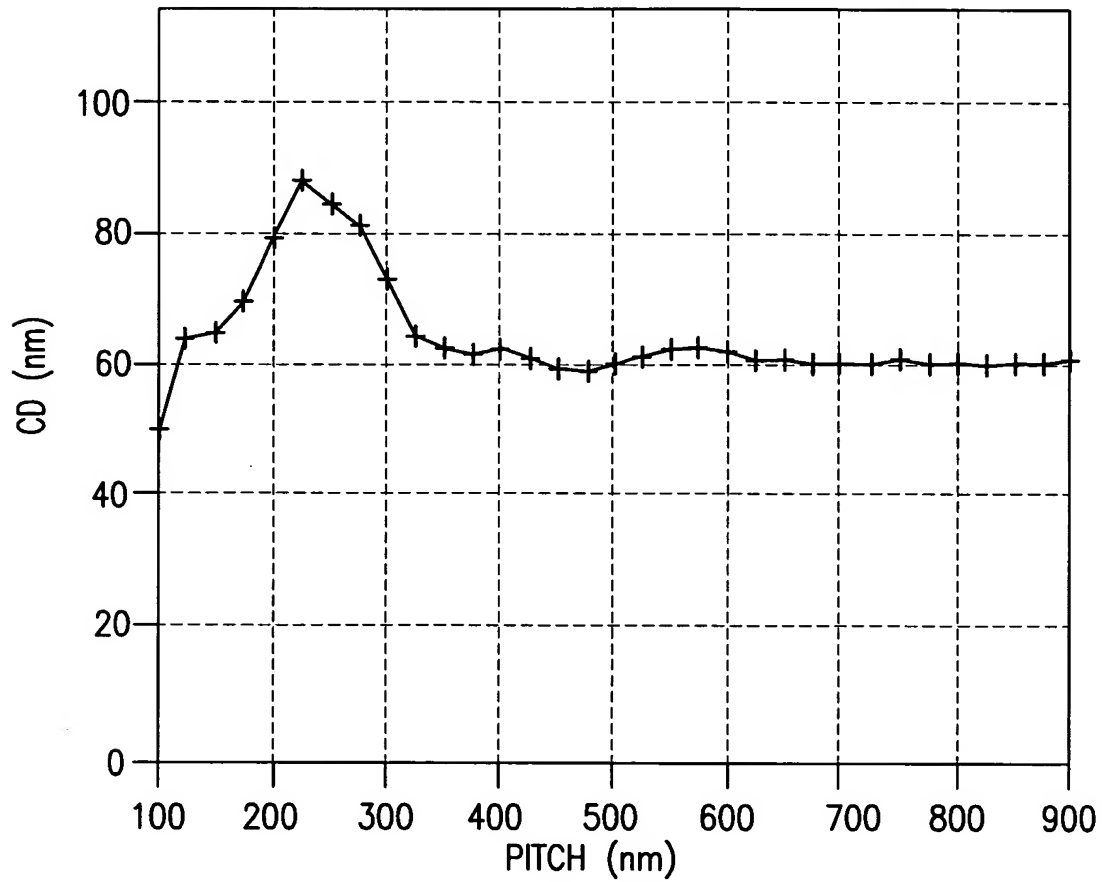


FIG.11A

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RESIST IMAGE NILS vs. PITCH  
CHROMELESS PHASE MASKS  
CARTESIAN 0.9/0.1 QUADRUPOLE ILLUMINATION, 0.93 NA, RADIAL POLARIZATION

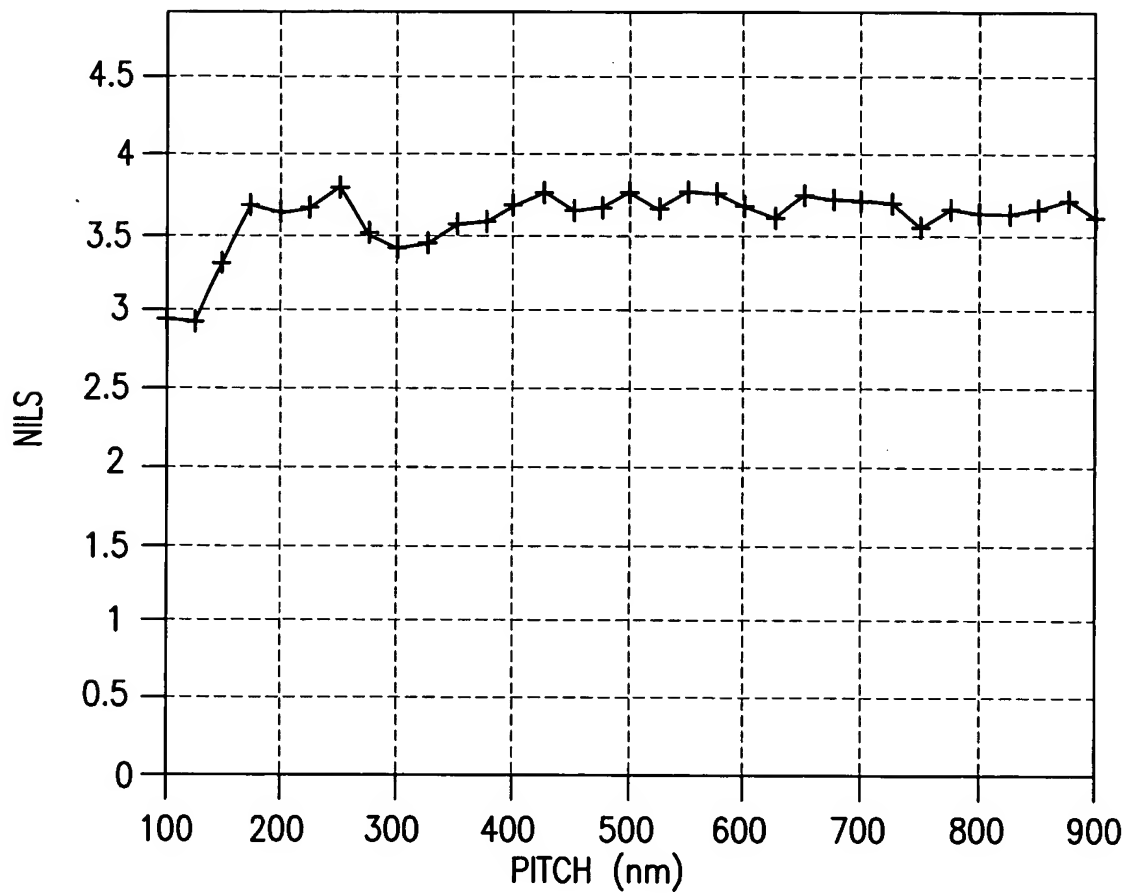


FIG. 11B

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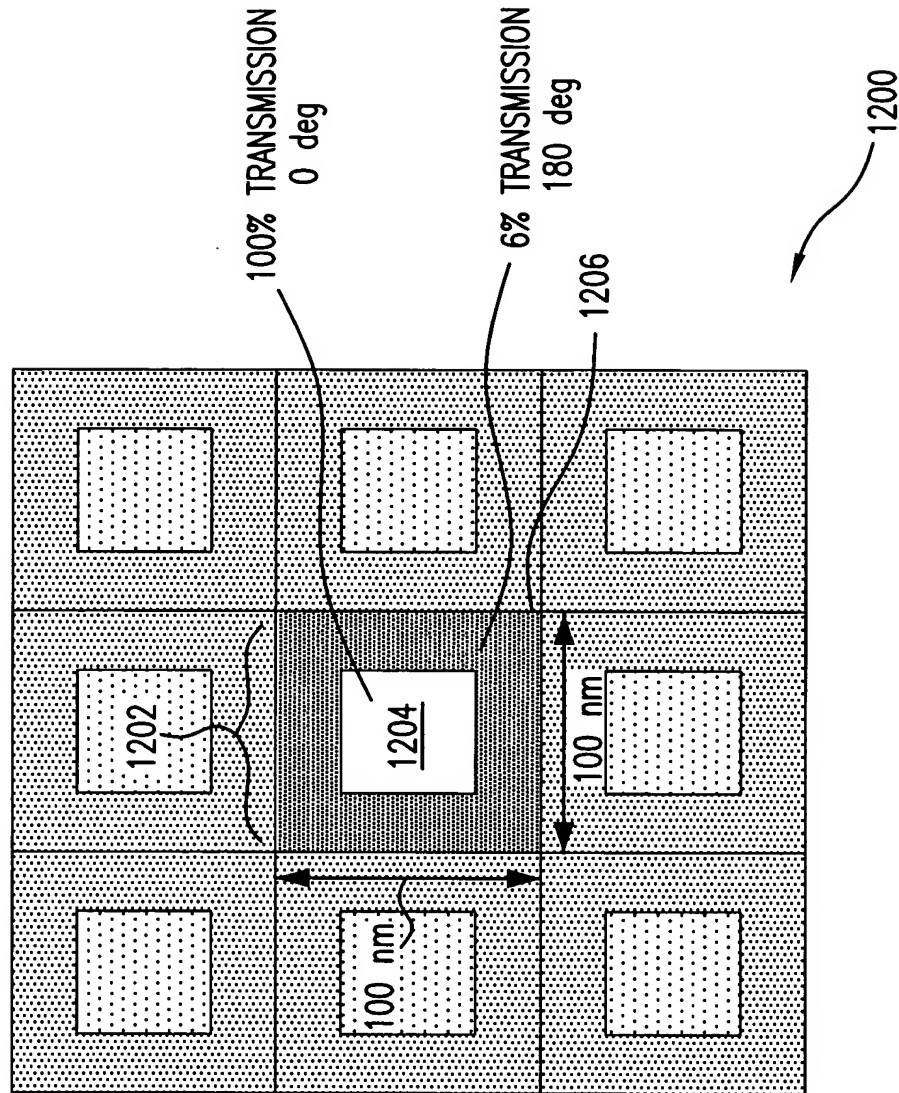


FIG. 12

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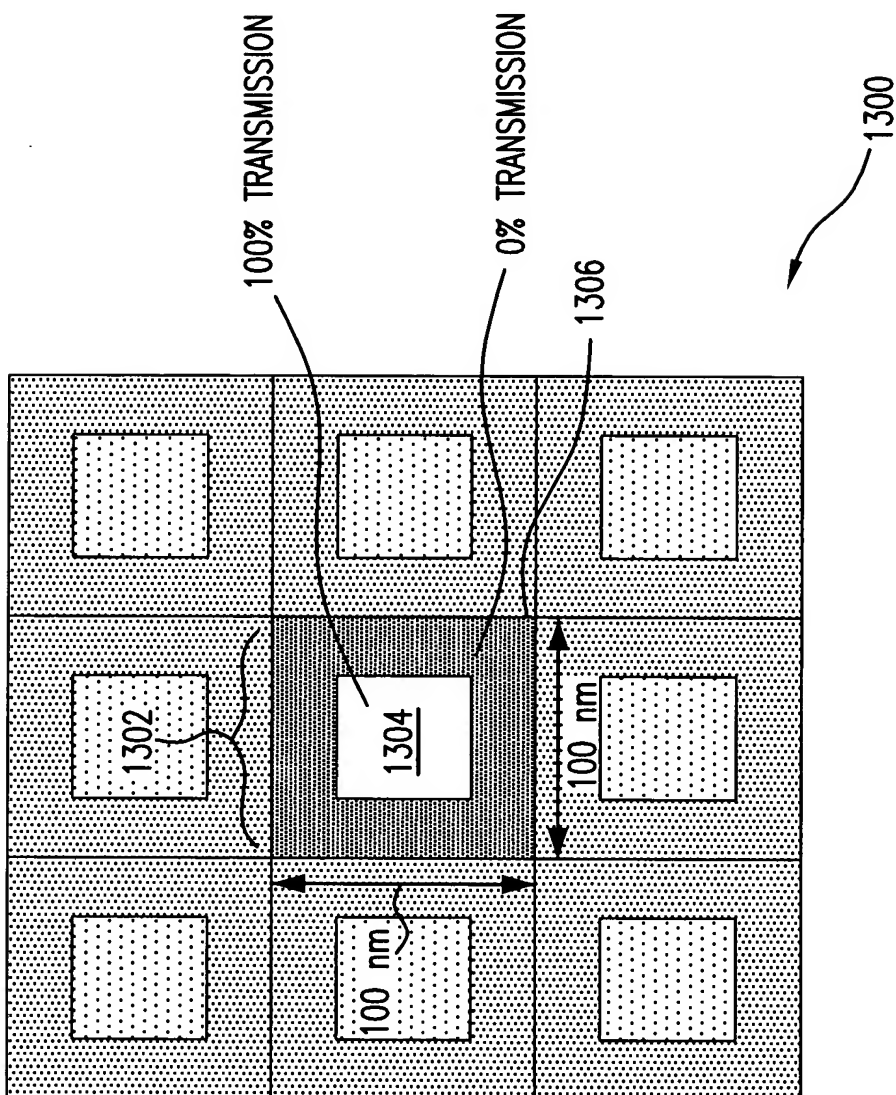


FIG. 13

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RESIST IMAGE AT BEST FOCUS,  $n=1.78$   
125 nm PITCH, 6% Att PSM, 67.5 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, UNPOLARIZED LIGHT,  
 $C_0=0.73$ ,  $C_{45deg}=0.64$   
 $NILS_0=1.85$ ,  $NILS_{45deg}=1.92$

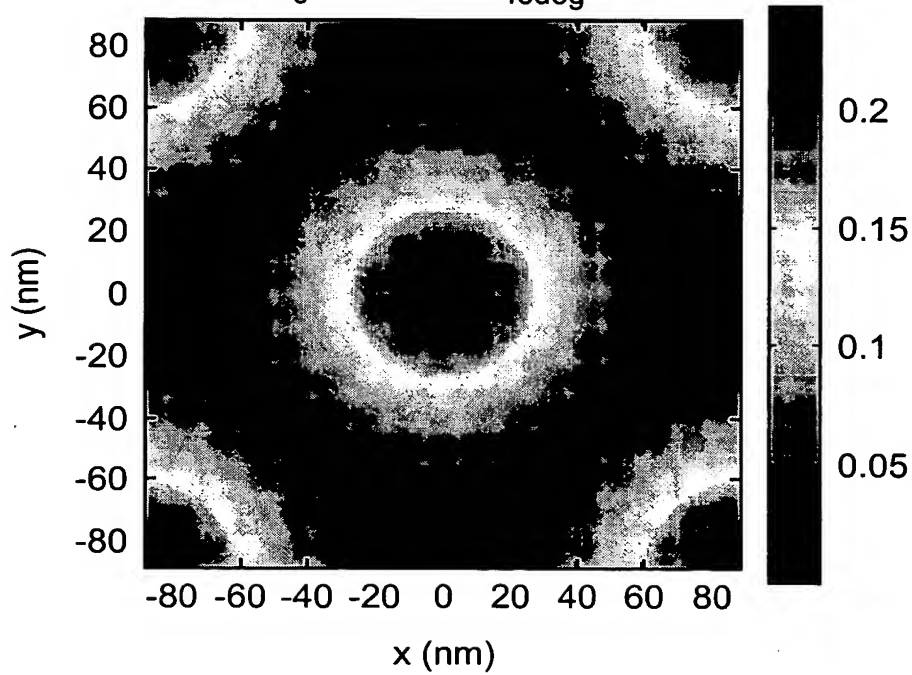


FIG.14A

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RESIST IMAGE AT BEST FOCUS,  $n=1.78$   
125 nm PITCH, 6% Att PSM, 67.5 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, TANGENTIAL POLARIZATION,  
 $C_0=0.78$ ,  $C_{45\text{deg}}=0.58$   
 $\text{NILS}_0=1.77$ ,  $\text{NILS}_{45\text{deg}}=1.82$

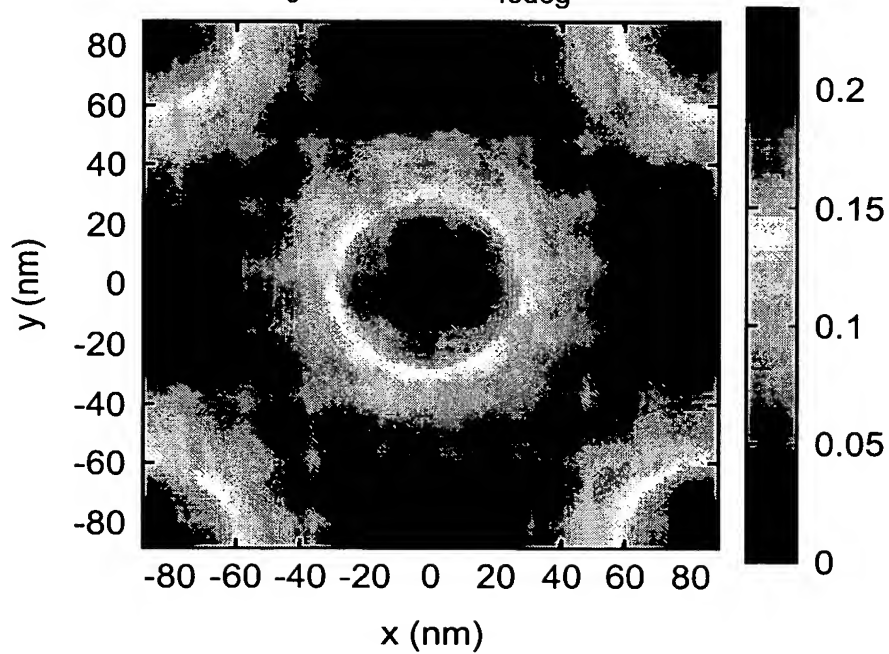


FIG. 14B



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RESIST IMAGE AT BEST FOCUS,  $n=1.78$   
125 nm PITCH, 6% Att PSM, 67.5 nm CONTACT WIDTH  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_0=0.69$ ,  $C_{45\text{deg}}=0.70$   
 $NILS_0=1.94$ ,  $NILS_{45\text{deg}}=2.09$

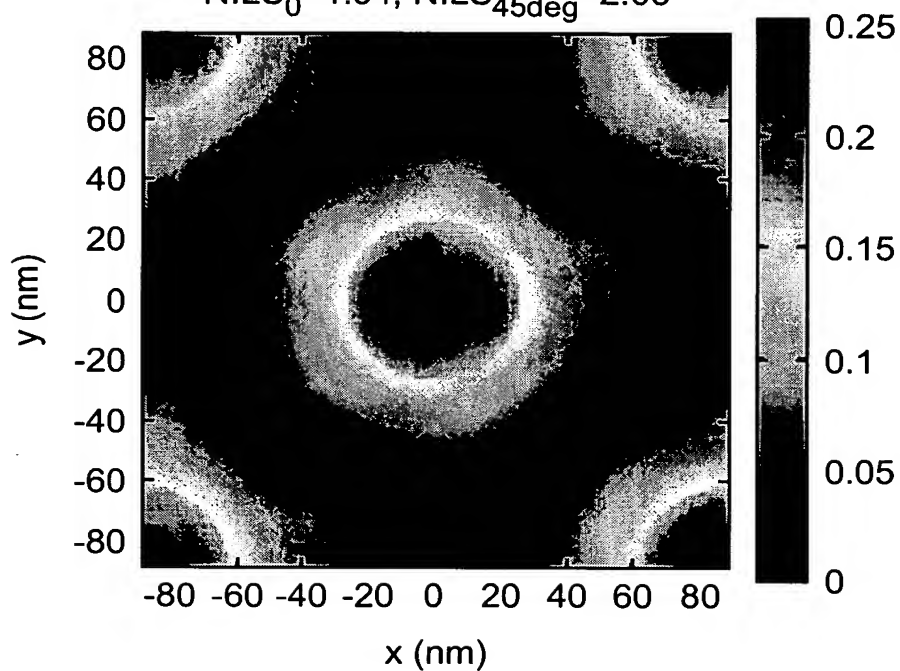


FIG.14C

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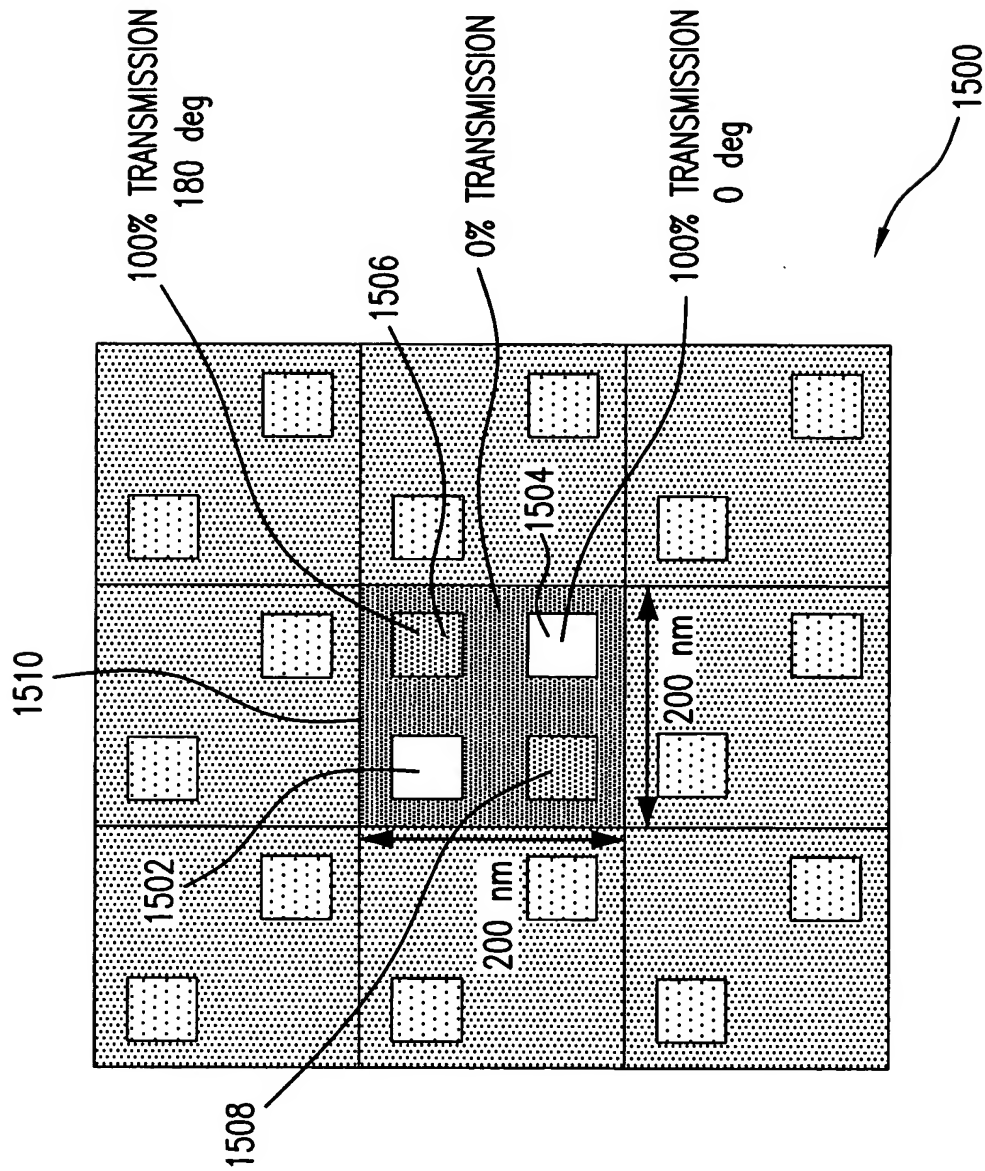


FIG. 15

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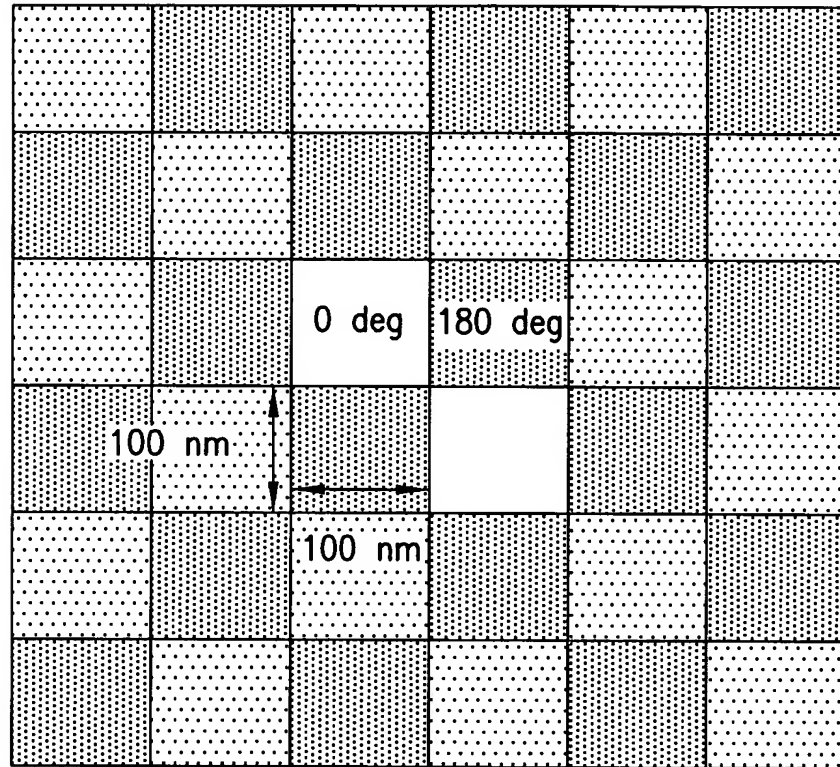


FIG.16

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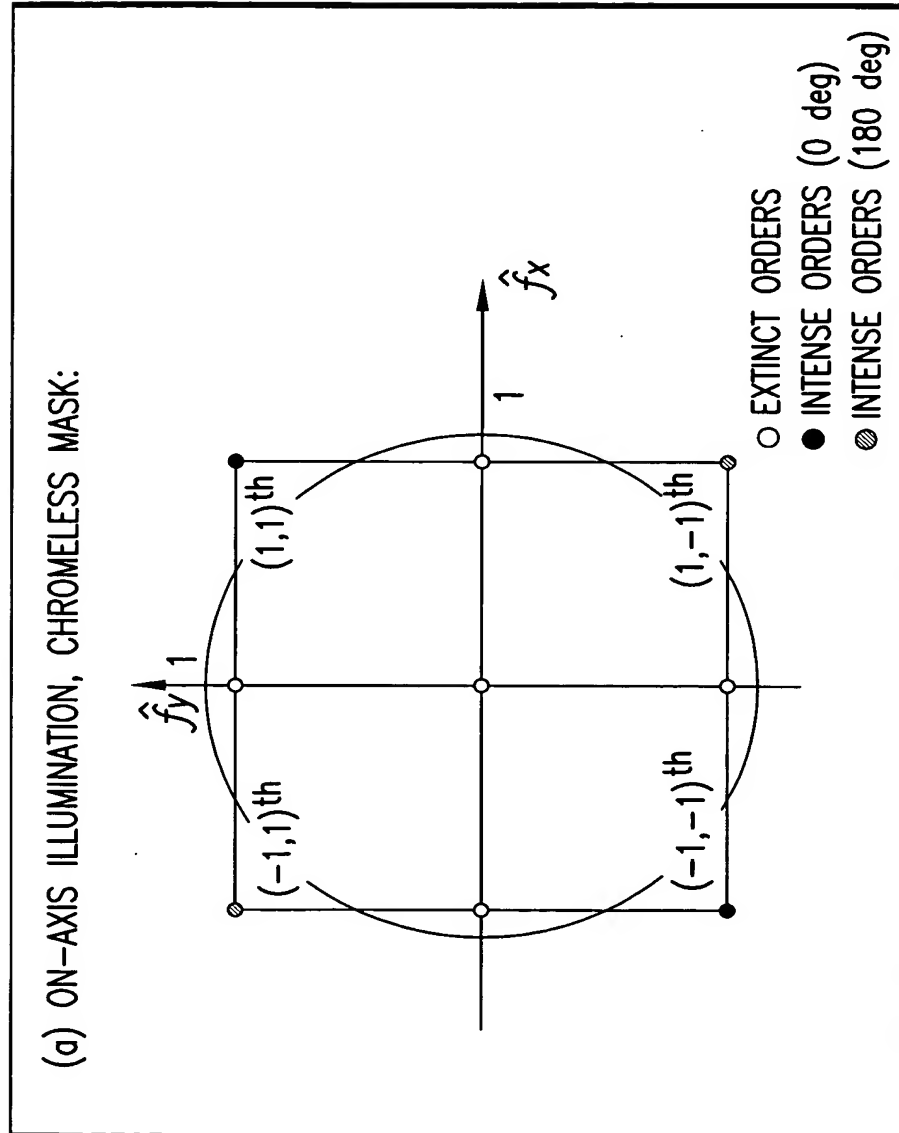


FIG.17A

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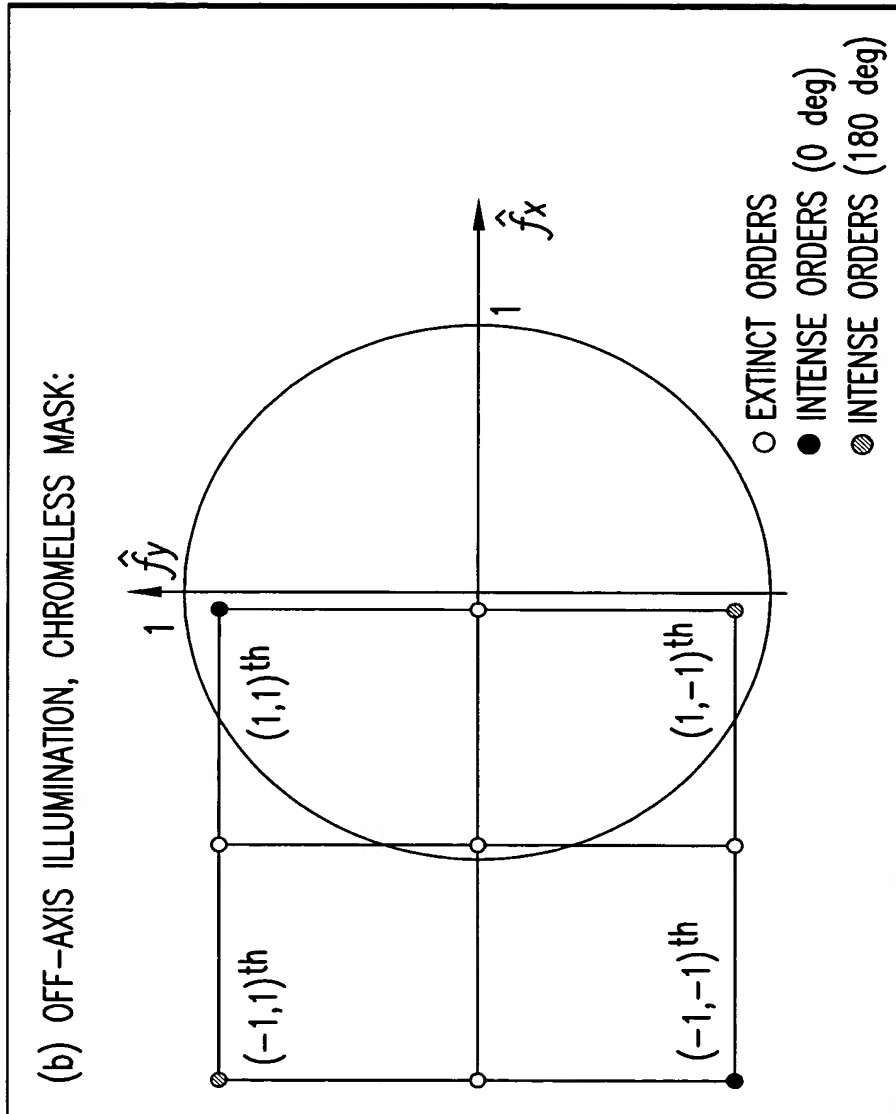


FIG.17B

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AERIAL IMAGE AT BEST FOCUS  
100 nm PITCH, CHROMELESS PSM  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_0=0.99$ ,  $C_{45\text{deg}}=0.99$   
 $\text{NILS}_0=3.10$ ,  $\text{NILS}_{45\text{deg}}=3.70$

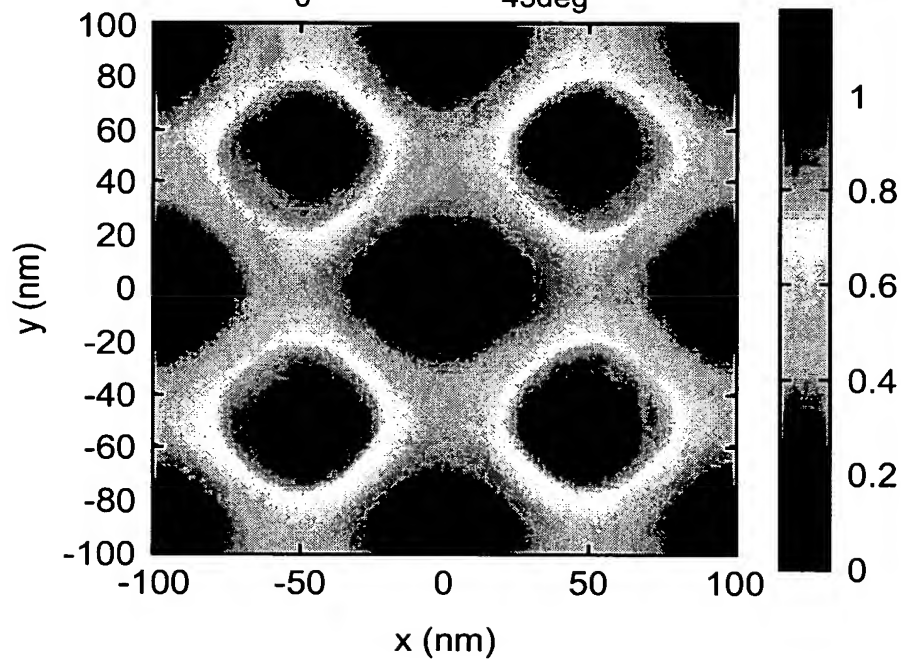


FIG.18A

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RESIST IMAGE  
100 nm PITCH, CHROMELESS PSM  
QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,  
 $C_0=0.94$ ,  $C_{45\text{deg}}=0.97$

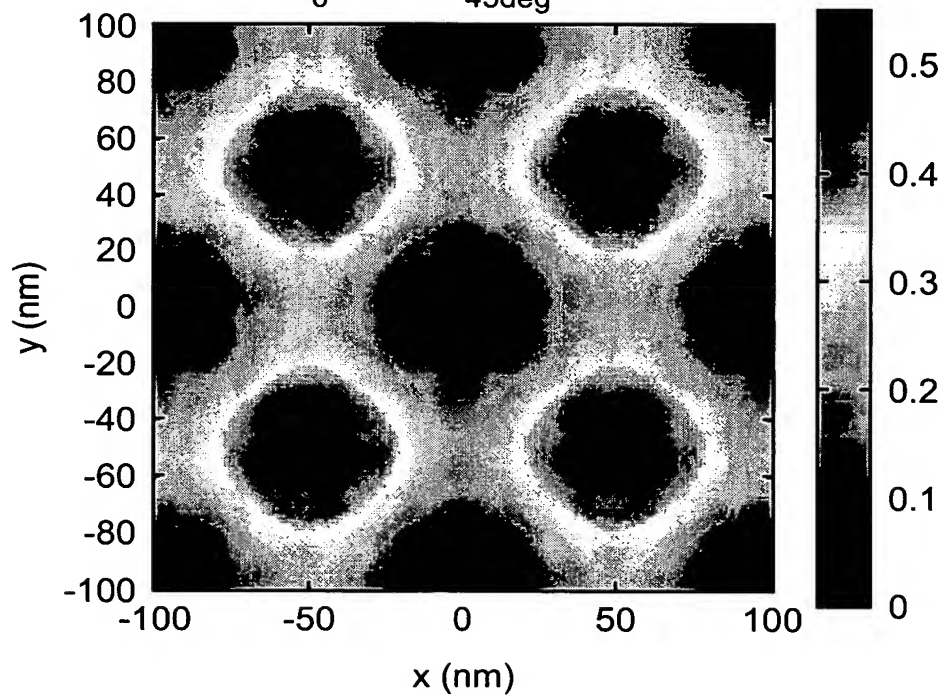


FIG.18B

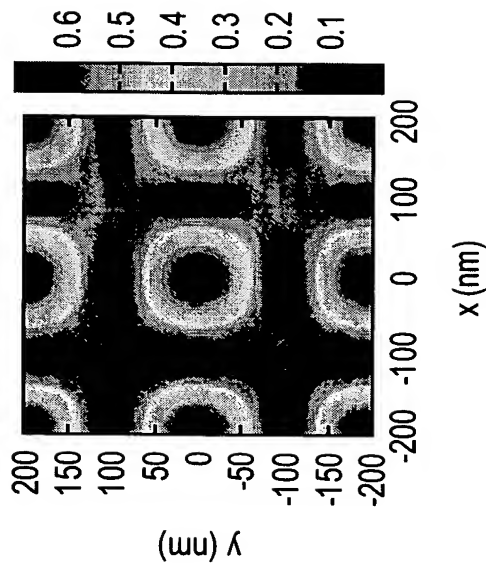
AERIAL IMAGE AT BEST FOCUS,  
 VARIABLE PITCH, CHROMELESS ALTERNATING PSMs

200-nm PITCH

AERIAL IMAGE AT BEST FOCUS

200 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.99$ ,  $C_2=0.98$  NILS<sub>1</sub>=3.33, NILS<sub>2</sub>=2.89



300-nm PITCH

AERIAL IMAGE AT BEST FOCUS

300 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.94$ ,  $C_2=0.94$  NILS<sub>1</sub>=3.03, NILS<sub>2</sub>=2.81

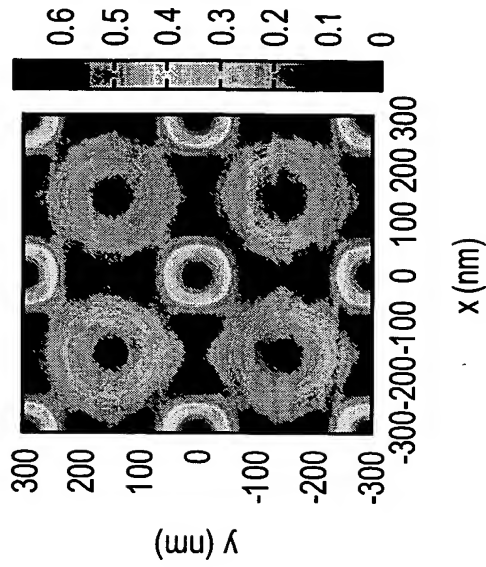


FIG.19A



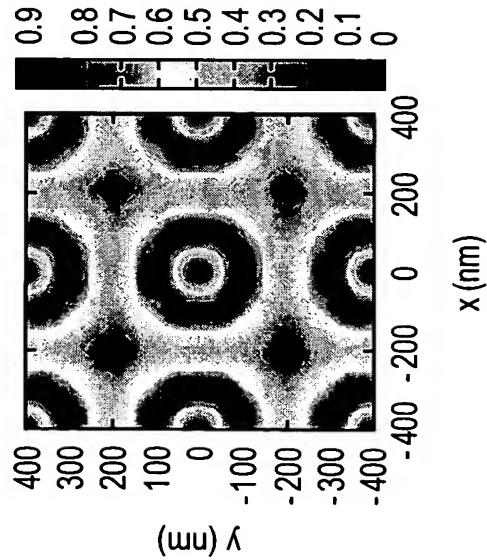
AERIAL IMAGE AT BEST FOCUS,  
 PITCH, CHROMELESS ALTERNATING PSMs

400-nm PITCH

AERIAL IMAGE AT BEST FOCUS

400 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.95$ ,  $C_2=0.94$  NILS<sub>1</sub>=3.31, NILS<sub>2</sub>=3.14



500-nm PITCH

AERIAL IMAGE AT BEST FOCUS

500 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.96$ ,  $C_2=0.95$  NILS<sub>1</sub>=3.35, NILS<sub>2</sub>=3.23

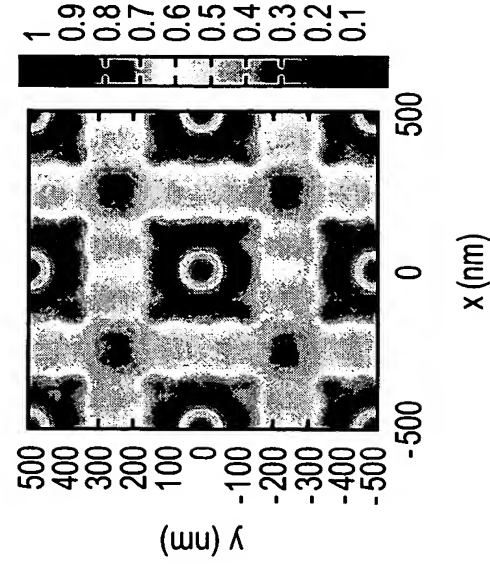


FIG.19B

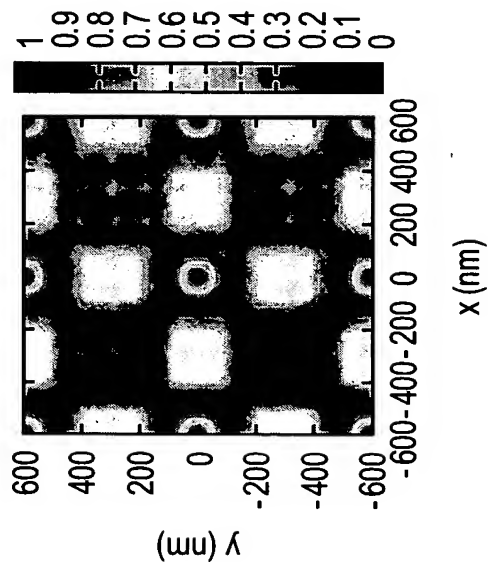
AERIAL IMAGE AT BEST FOCUS,  
 VARIABLE PITCH, CHROMELESS ALTERNATING PSMS

600-nm PITCH

AERIAL IMAGE AT BEST FOCUS

600 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.95$ ,  $C_2=0.95$  NILS<sub>1</sub>=3.32, NILS<sub>2</sub>=3.13



1000-nm PITCH

AERIAL IMAGE AT BEST FOCUS

1000 nm PITCH, CHROMELESS PSM CONTACT HOLES  
 C-QUADRUPOLE ILLUMINATION, RADIAL POLARIZATION,

$C_1=0.95$ ,  $C_2=0.97$  NILS<sub>1</sub>=3.34, NILS<sub>2</sub>=3.21

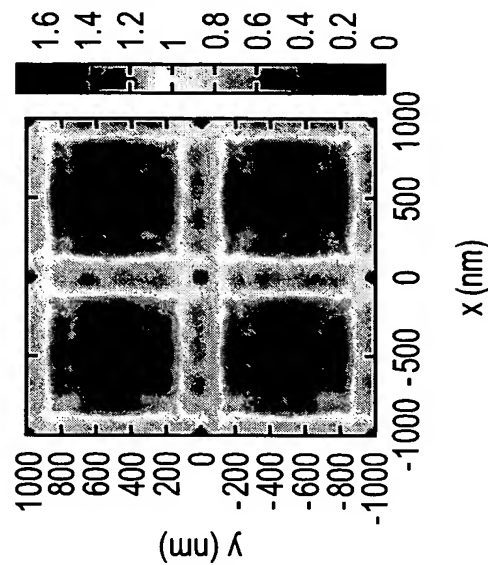


FIG.19C

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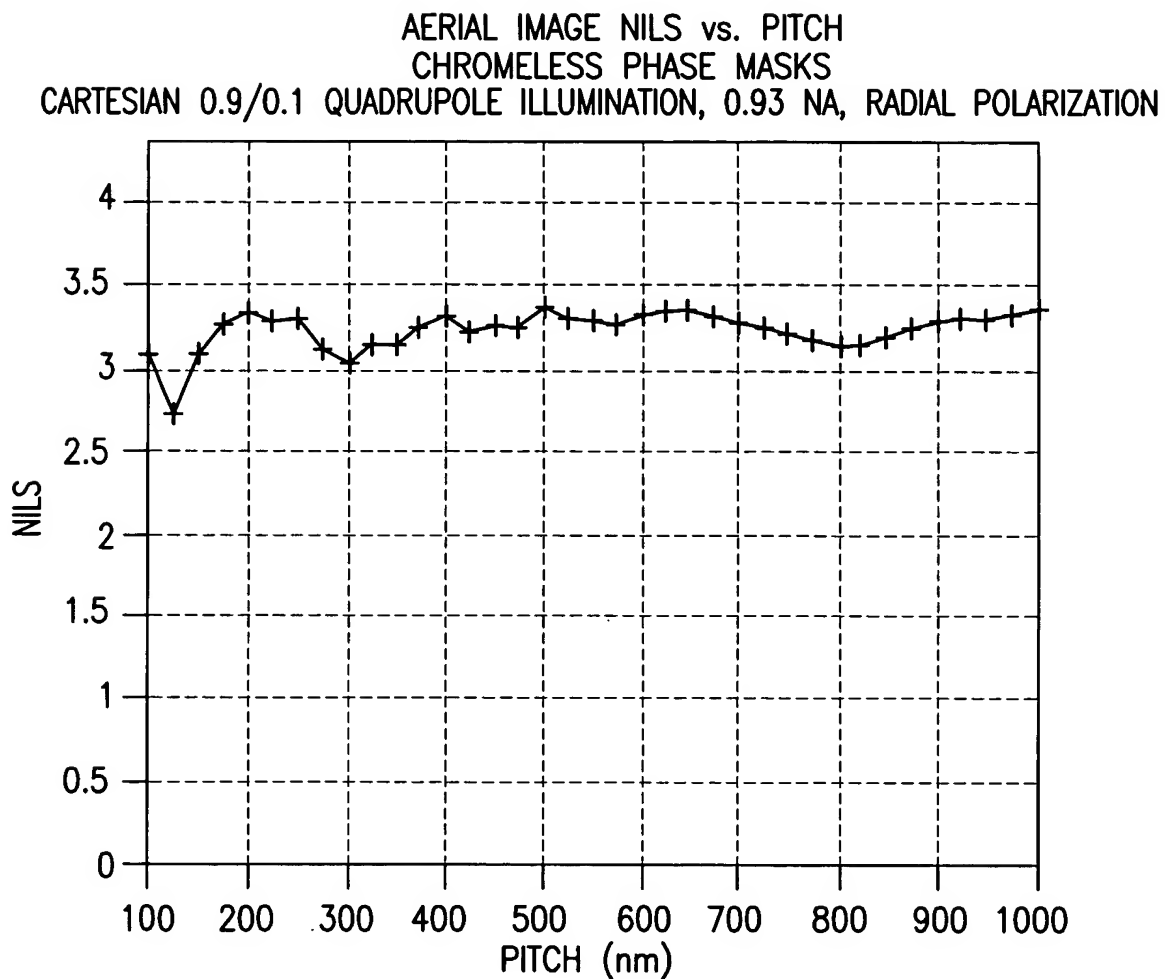


FIG.20A

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AERIAL IMAGE CD vs. PITCH  
VARIABLE PITCH CHROMELESS PHASE MASKS  
CARTESIAN 0.9/0.1 QUADRUPOLE ILLUMINATION, 0.93 NA, RADIAL POLARIZATION

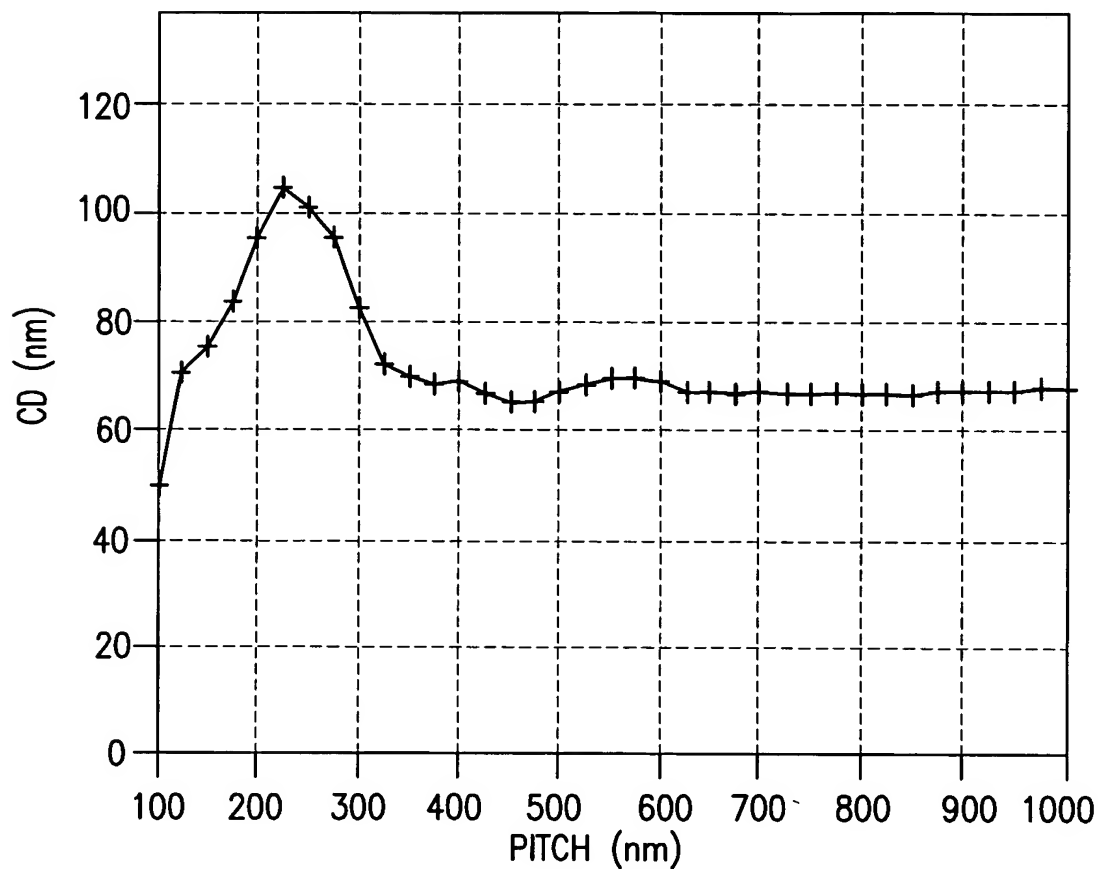


FIG.20B

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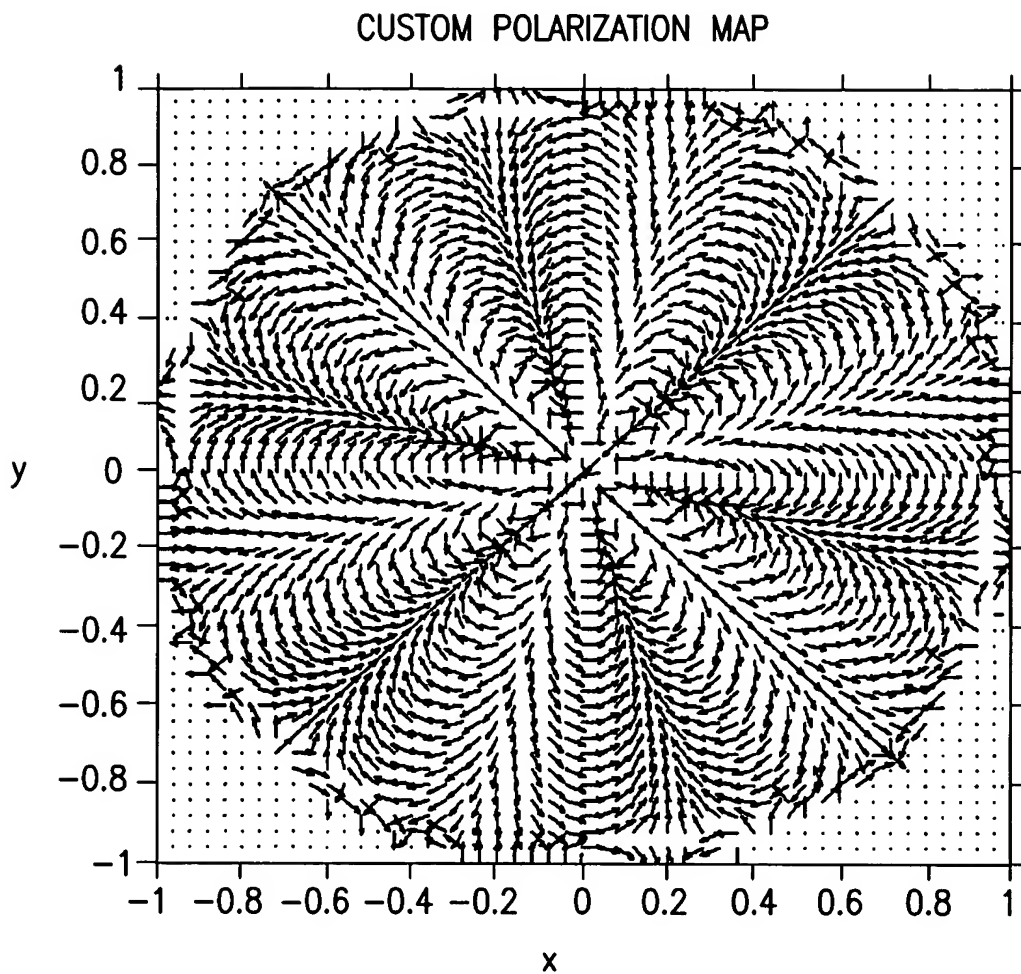


FIG.21A

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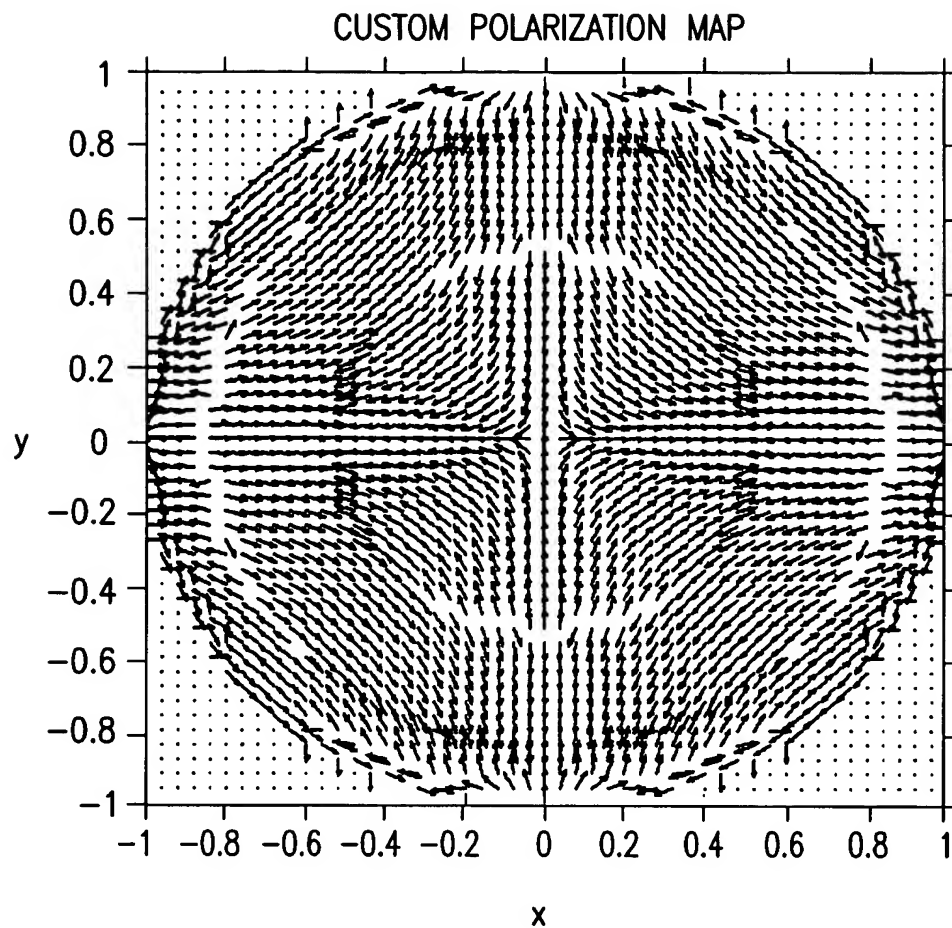


FIG.21B

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IMMERSION IMAGE AT BEST FOCUS  
100 nm PITCH, CHROMELESS PSM CONTACT HOLES  
QUADRUPOLE ILLUMINATION, UNPOLARIZED LIGHT,  
 $C_0=0.62$ ,  $C_{45\text{deg}}=0.72$   
 $\text{NILS}_0=1.86$ ,  $\text{NILS}_{45\text{deg}}=1.74$

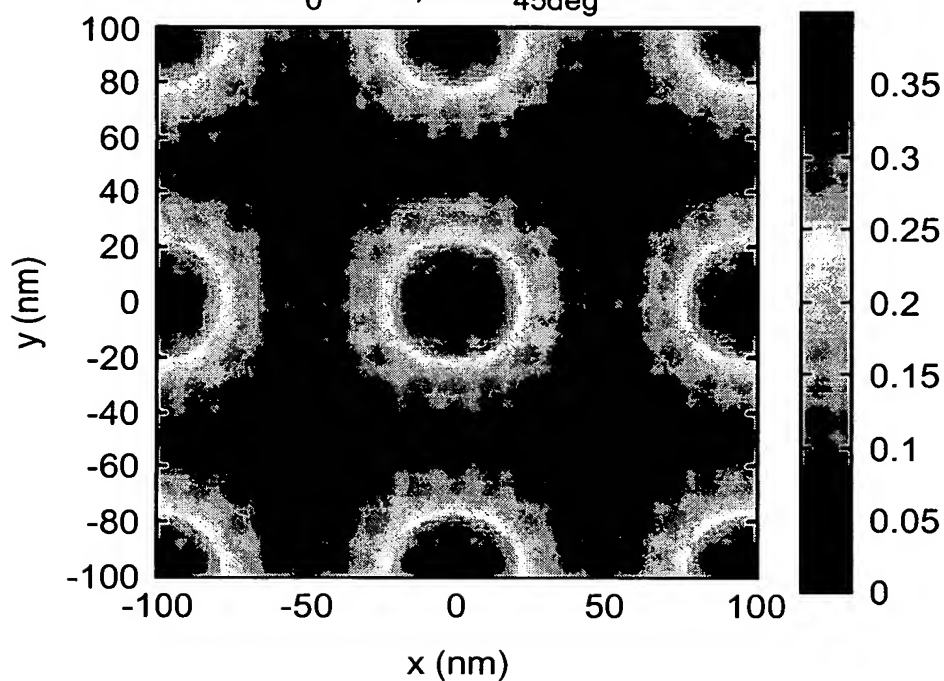


FIG.22

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AERIAL IMAGE AT BEST FOCUS, 13.4 nm WAVELENGTH, 0.25 NA  
100 nm PITCH BINARY MASK, 50 nm CONTACT WIDTH  
CONVENTIONAL 0.6 PC, UNPOLARIZED LIGHT,

$$C_0=0.98, C_{45\text{deg}}=0.99$$
$$\text{NILS}_0=5.63, \text{NILS}_{45\text{deg}}=5.27$$

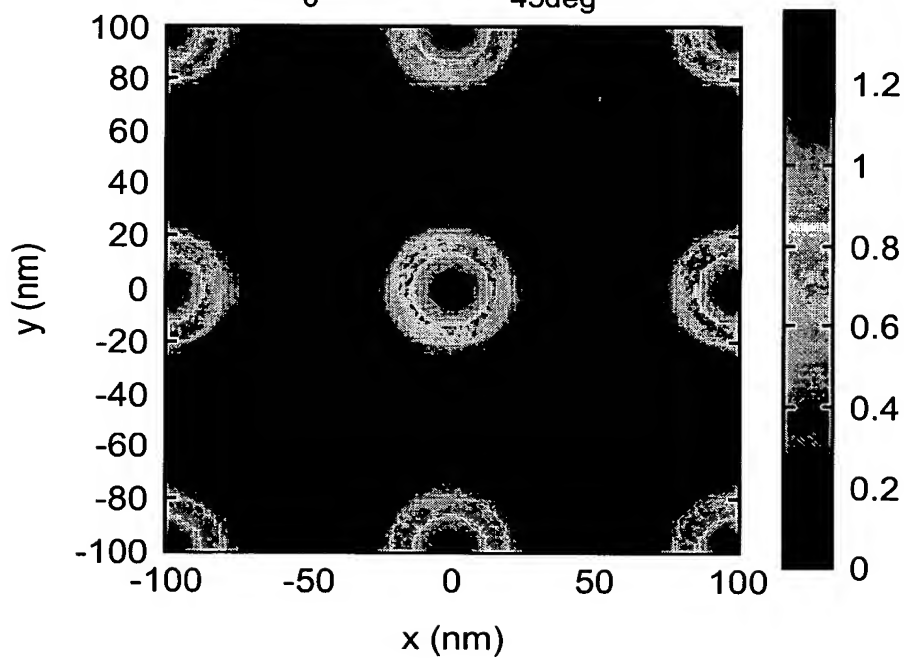


FIG.23